



## *Verrucaria alborimosa*, a new maritime lichen from Flinders Island, Tasmania

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### Introduction

Seven intertidal species of *Verrucaria* Schrad. (lichenized Ascomycota, Verrucariaceae) are known from rocky seashores in Australia, where they are regularly subjected to wave or splash action: *V. halizoa* Leight., *V. corallensis* P.M. McCarthy, *V. maura* Wahlenb., *V. meridionalis* P.M. McCarthy, *V. microsporoides* Nyl., *V. striatula* Wahlenb. and *V. subdiscreta* P.M. McCarthy (McCarthy 2012). Four others are commonly or exclusively found in the supralittoral spray zone, *Verrucaria aucklandica* Zahlbr., *V. australiensis* P.M. McCarthy, *V. fusconigrescens* Nyl. and *V. prominula* Nyl. (McCarthy 2012), sometimes in association with more landward populations of *V. maura* and *V. subdiscreta*.

In this paper, *V. alborimosa* P.M. McCarthy & Kantvilas sp. nov. is reported from limestone in coastal heathland in the supralittoral of Flinders Island, Tasmania. A revised key is provided to the 12 marine and maritime *Verrucariae* in Australia.

### *Verrucaria alborimosa* P.M. McCarthy & Kantvilas, sp. nov.

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Characterised by the very dark, subgelatinous, rimose-areolate and non-punctate thallus, small and inconspicuous perithecia with broadly clavate asci, comparatively long periphyses, a thin and predominantly hyaline excipulum and small, broadly ellipsoid ascospores.

**Type:** TASMANIA. Flinders Island, The Dock, 39°48'S, 147°52'E, alt. 10 m, on limestone in coastal heathland, *G. Kantvilas* 303/14, 21.iii.2014 (holotype: HO 573957).

### Abstract

*Verrucaria alborimosa* P.M. McCarthy & Kantvilas (lichenized Ascomycota, Verrucariaceae) is described from coastal limestone in Flinders Island, Tasmania. A key is provided to the 12 marine and maritime species of *Verrucaria* in Australia.

**Key words:** taxonomy, distribution, coastal

*Thallus* crustose, epilithic, determinate, c. 20–25 mm wide, 20–60(–80)  $\mu\text{m}$  thick, greenish black (somewhat darker when older and thicker, much paler when partially shaded), rimose to areolate; sterile areolae 0.12–0.3(–0.38) mm wide, usually plane, dull, angular or more rounded, smooth to minutely and shallowly uneven, commonly rimulose, becoming greener and subgelatinous when wetted, lacking black external and internal punctae, ridges or other pigmented markings; rimae 30–60  $\mu\text{m}$  wide when dry, the whitish substratum commonly visible at their base. *Cortex* absent; mycobiont cells hyaline, hyphal and 3–4  $\mu\text{m}$  wide, or paraplectenchymatous and 3–5  $\times$  2–3  $\mu\text{m}$ ; basal cells of the thallus hyaline, more thick-walled than distal cells, 3–4  $\mu\text{m}$  wide. *Algal cells* yellowish green to green, globose, scattered or clustered, not forming columns, 5–10(–12)  $\mu\text{m}$  wide. *Prothallus* not apparent. *Perithecia* moderately numerous, largely immersed or becoming semi-immersed, usually solitary, (0.17–)0.23(–0.31) mm diam. [(min.–)mean(–max.);  $n = 20$ ], dull black, not overgrown by the thallus, or with a c. 10  $\mu\text{m}$  thick layer of thallus which is visible only in section; post-mature perithecia becoming excavate to crateriform as the involucrellum and perithecial contents disintegrate. *Perithecial apex* smooth and rounded, or slightly uneven; *ostiole* inconspicuous or, more commonly, in a c. 20–30  $\mu\text{m}$  wide apical depression. *Involucrellum* greenish black in thin section, extending down to excipulum-base level while spreading laterally at an angle of c. 45°, 40–50  $\mu\text{m}$  thick at the apex, 20–30  $\mu\text{m}$  thick near the base. *Centrum* depressed-ovate, 0.14–0.21 mm diam. *Subhymenium* 10–15  $\mu\text{m}$  thick, hyaline. *Excipulum* 10–15  $\mu\text{m}$  thick, hyaline at the sides and base, hyaline to greenish brown or medium grey-brown near the apex; cells 4–7  $\times$  2–3  $\mu\text{m}$ . *Periphyses* unbranched, 25–35(–40)  $\times$  1.5–2  $\mu\text{m}$ . *Paraphyses* absent. *Hymenial gel* fleetingly l+ wine-red. *Asci* 8-spored, broadly clavate, 35–40  $\times$  14–20  $\mu\text{m}$  [ $n = 15$ ]. *Ascospores* simple, hyaline, usually broadly ellipsoid, occasionally subglobose, massed in the ascus, (9–)12.5(–15)  $\times$  (7–)8.5(–10)  $\mu\text{m}$  [(min.–)mean(–max.);  $n = 62$ ]; contents finely granulate to clear and vacuolate. *Conidiomata* absent. (Fig. 1)

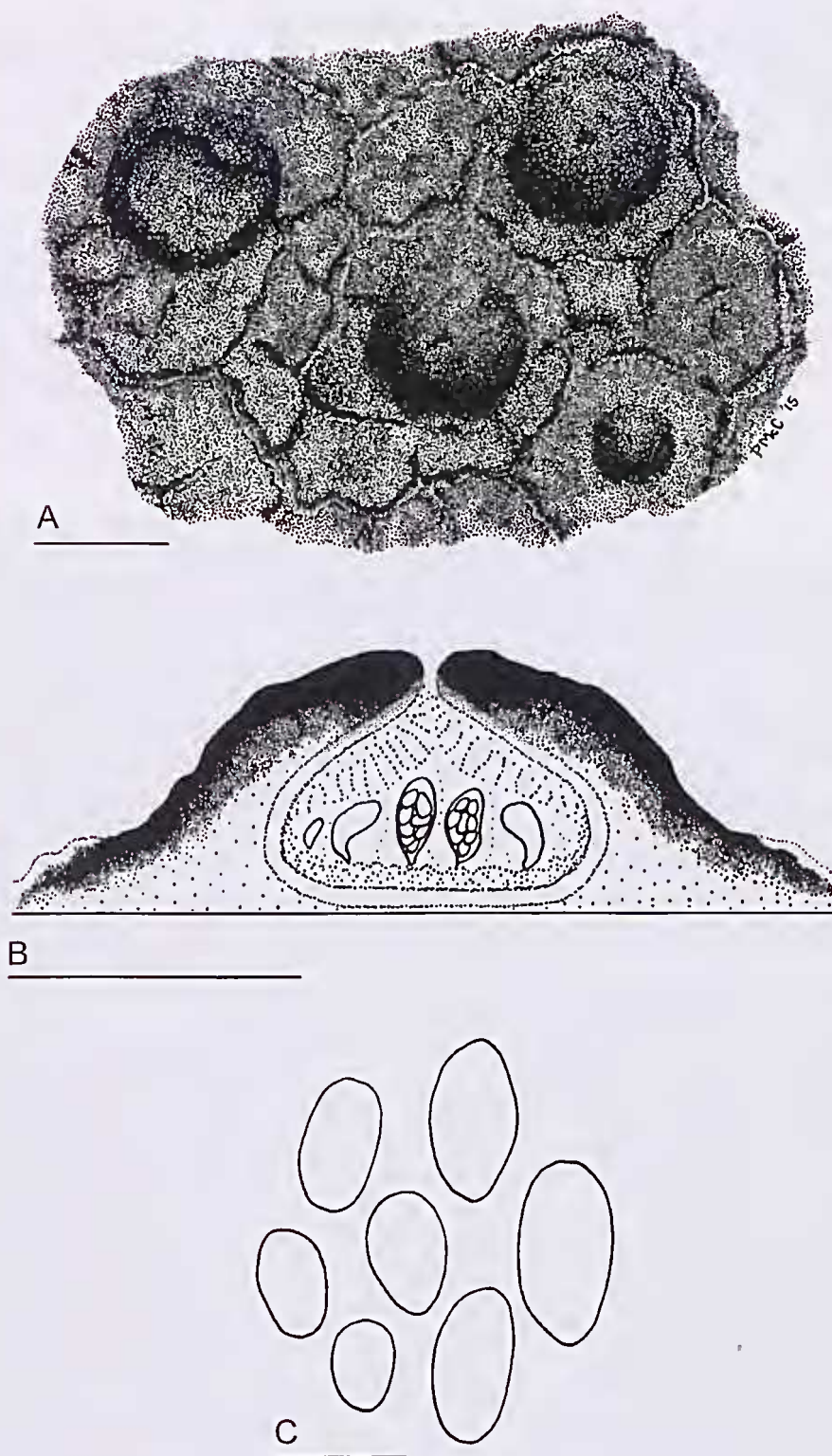
**Distribution and habitat:** This lichen is known only from the type collection on the western coast of Flinders Island, Bass Strait, where it grew on outcrops

of Quaternary limestone in coastal heathland. The substratum is relatively soft and highly weathered, and in the actively eroding, sand-blasted cliff edge, lichens are few or absent. The new species instead occurred in more sheltered microhabitats, on low, flat rock plates in gaps among the low, wind-pruned shrubs. Associated species included *Buellia albula* (Nyl.) Müll.Arg., *Caloplaca jerramungupensis* S.Y.Kondr., Kärnefelt & Elix, *C. yorkensis* S.Y.Kondr. & Kärnefelt, *Catillaria polycarpa* (Müll.Arg.) Zahlbr., *Placynthium nigrum* (Huds.) S.F.Gray s. lat., *Sarcogyne* sp., *S. meridionalis* P.M.McCarthy & Kantvilas and *V. maura*.

**Etymology:** The epithet is derived from *albo-* (white) and *rimosa* (cracked), in reference to the whitish limestone substratum being visible at the base of some cracks in the thallus.

**Discussion:** *Verrucaria alborimosa* is characterised by its very dark, subgelatinous, rimose-areolate and non-punctate thallus, small and inconspicuous perithecia with broadly clavate asci, comparatively long periphyses, a thin and predominantly hyaline excipulum and small, broadly ellipsoid ascospores. It is readily distinguished from its associate, the pantemperate *V. maura* which has a thicker, black-punctate thallus with a blackish hypothallus and larger perithecia, asci and ascospores (Orange et al. 2009; McCarthy 2012). The mainly Australasian *V. subdiscreta* is even more diminutive, but has a thallus that is commonly black-punctate, as well as smaller asci, shorter periphyses and narrower ascospores (McCarthy 2012).

In a significant re-evaluation of *Verrucaria* s. lat. based on molecular phylogenetic analysis and morphological considerations, Gueidan et al. (2009) resurrected and/or re-circumscribed old segregates and described new genera including *Hydroverrucaria* Keller, Gueidan & Thüs and *Wahlenbergiella* Gueidan & Thüs. These genera include intertidal and freshwater species, and they were segregated from *Verrucaria* based on molecular differences and the occurrence of pigmented dots and ridges on and/or within the thallus, and were distinguished from one-another by thalline anatomy and pigmentation and ascospore dimensions. However, we prefer to retain all Australian species (intertidal as well and terrestrial, freshwater and lichenicolous) in a broadly circumscribed *Verrucaria* (McCarthy 2012), at



**Figure 1.** *Verrucaria alborimosa* (holotype): A. habit of thallus and perithecia; B. vertical section of perithecium (semi-schematic); C. ascospores. Scale bars: A = 0.2 mm; B = 0.1 mm; C = 10  $\mu$ m



least pending a comparable assessment incorporating the numerous Australian and Australasian endemics, among them the punctate/ridged, intertidal species *V. corallensis* P.M.McCarthy and *V. subdiscreta* P.M.McCarthy.

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### Key to *Verrucaria* on rocky seashores in Australia

- 1 Thallus endolithic or epilithic and inconspicuous (often visible only around perithecia), pale grey-green or pale pinkish grey; supralittoral species ..... 2
- 1: Thallus epilithic and conspicuous, grey-brown to greenish brown, medium green, olive-green, green-black or black; littoral or supralittoral species ..... 3
- 2 Perithecia 0.1–0.2 mm diam., semi-immersed to ±completely immersed; involucrellum absent; growing on limestone ..... *V. australiensis*
- 2: Perithecia 0.4–0.7 mm diam., semi-immersed to almost superficial; involucrellum thick and well-developed; growing on siliceous rocks ..... *V. praminula*
- 3 Thallus continuous to sparingly rimose; lower littoral to mid-littoral species ..... 4
- 3: Thallus richly and deeply rimose to areolate; upper littoral to supralittoral species ..... 8
- 4 Ascospores 10–20 µm long ..... 5
- 4: Ascospores 6–13 µm long ..... 6
- 5 Thallus with sparse to abundant black dots and ridges (especially distinct when the thallus is wetted); ascospores 13–20 × 3.5–5.0 µm; NE Queensland ..... *V. corallensis*
- 5: Thallus lacking black dots and ridges; ascospores 10–16(–18) × 3.5–6.0(–8.0) µm; SE Australia ..... *V. micrasporoides*
- 6 Thallus with elongate, simple or branched, carbonaceous ridges; perithecia frequently becoming excavate and irregularly uneven at maturity ..... *V. striatula*
- 6: Thallus lacking carbonaceous ridges; perithecia remaining hemispherical at maturity ..... 7
- 7 Perithecia 0.2–0.3 mm diam.; involucrellum 30–40 µm thick; ascospores 4.5–6.5 µm wide ..... *V. halizaa*
- 7: Perithecia 0.25–0.45 mm diam.; involucrellum 70–100 µm thick; ascospores 5.5–10.5 µm wide ..... *V. meridianalis*
- 8 Ascospores 8–16(–18) µm long ..... 9
- 8: Ascospores 12–26 µm long ..... 11
- 9 Perithecia 0.2–0.45 mm diam.; thallus pale grey-brown to medium greenish brown ..... *V. aucklandica*
- 9: Perithecia 0.1–0.3 mm diam.; thallus dark olive-green to greenish black ..... 10
- 10 Ascospores 4.0–6.5 µm wide; asci 25–35 × 10–14 µm; perithecia 0.1–0.2 mm diam ..... *V. subdiscreta*
- 10: Ascospores 7–10 µm wide; asci 35–40 × 14–20 µm; perithecia 0.15–0.3 mm diam ..... *V. alborimosa*
- 11 Thallus medium greenish grey to dark grey-brown; perithecia semi-immersed to almost superficial ..... *V. fusconigrescens*
- 11: Thallus dark grey-green to greenish black; perithecia ±completely immersed in the thallus to semi-immersed; if prominent, then partly or almost completely overgrown by a thick layer of thallus ..... *V. maura*